Impacts of Alternative Fuels on Air Quality

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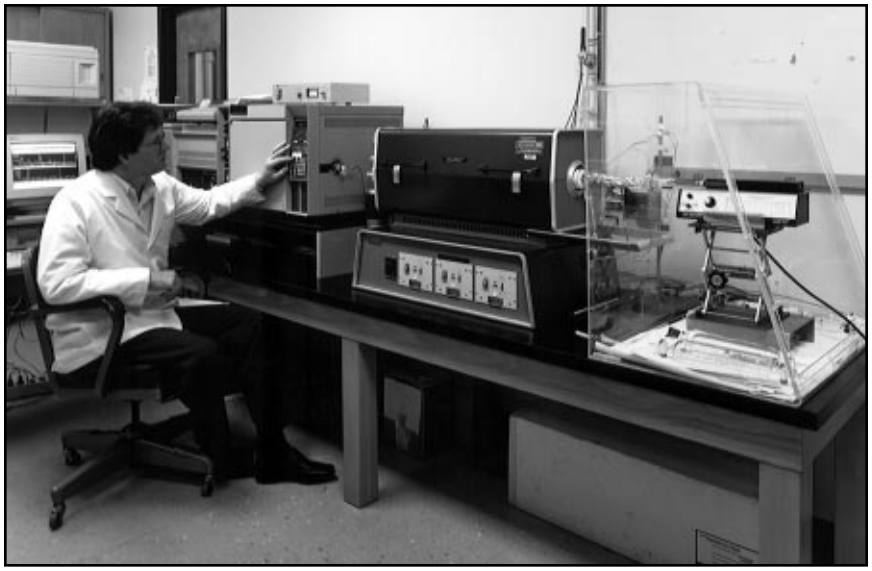
Objectives

- To quantify emissions of trace level organic compounds from the thermal degradation of methanol (MeOH), ethanol (EtOH), compressed natural gas (CNG), and liquefied petroleum gas (LPG)
- To determine the atmospheric reactivity of these alternative fuels as a function of exposure temperature and equivalence ratio
- To correlate emissions with engine dynamometer tests being conducted by Southwest Research Institute.



The UDRI Thermal Decomposition Analytical System (TDAS)

Approach

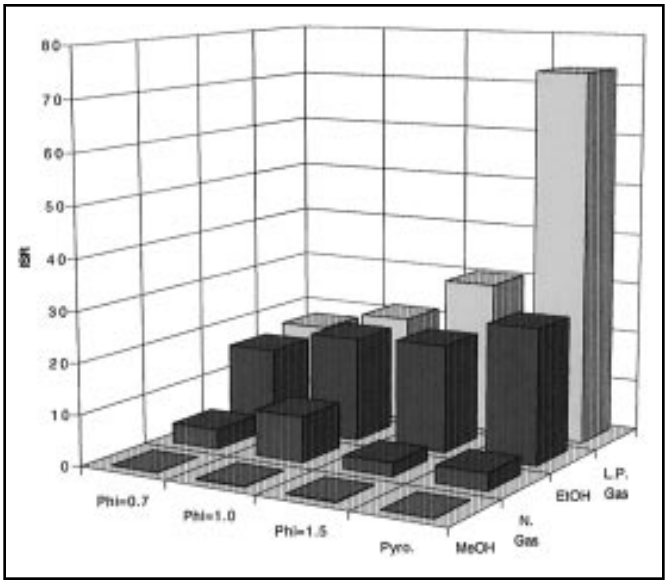
Experiments are conducted using a high-temperature thermal instrumentation system referred to as the Thermal Decomposition Analytical System (TDAS). Thermal exposures are conducted as a function of residence time, temperature, and equivalence ratio. Organic compounds are separated, detected, and quantified using in-line hyphenated techniques (gas chromatography-mass spectrometry [GC-MS], gas chromatography-flame ionization detection [GC-FID], and gas chromatography-thermal conductivity detection [GC-TCD]).

Accomplishments

Thermal degradation experiments for MeOH, EtOH, CNG, and LPG are complete. MeOH and EtOH produced much lower yields of organic emissions than CNG and LPG. The high-temperature (750°–1050°C) organic emission yields generally followed this trend: MeOH < EtOH < CNG ≈ LPG. With respect to atmospheric reactivity, the following trend was generally observed: MeOH < CNG < EtOH < LPG.

Future Direction

We will extend these experiments to include measurements of reformulated gasoline (RFG) and conventional gasoline. Correlations between our results and those of Southwest Research Institute will be developed.



Publications

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